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Efficacy of the Fungus, *Metarhizium anisopliae* var. *acridum* against Some Acridid Insects

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ABSTRACT

Acrididae pests are serious agricultural pests that cause considerable damage to food crops and pasture grasses, particularly during outbreaks. New control strategies aim to use of relatively safe materials such as pathogens. In this study, *Metarhizium anisopliae* var. *acridum* (Green Muscle) was applied against some Acrididae pests at different periods in some places in Egypt considered favorable breeding sites to test its efficacy on the target pests under the Egyptian ecological conditions. Results showed that the efficacy of *M. anisopliae* var. *acridum*, in all treatments, indicated that it was a specific bio-pesticide for controlling Acrididae pests but it seems to be slow acting as a bio-agent unlike chemical pesticides. Efficient applications were in case of grasshoppers, desert locust nymphs, desert locust adults or migratory locust adults and then local locust (trees locust), respectively. At field application rates, 50 g/ha dose (diluted in diesel) of *M. anisopliae* var. *acridum* resulted in an optimal mortality of locusts and grasshoppers in the cages during 21 days, followed by 50 g/ha dose diluted in vegetable oil, respectively. Use of diesel for dilatation may be more practical than vegetable oil. Accordingly, Green Muscle® can be useful for developing different elements of an IPM strategy as a preventive measure whereas chemical insecticides will be most effective in curative treatments.

Key words: *Metarhizium*, Acrididae, locust, *Schistocerca gregaria*, Grasshoppers, biological control.

INTRODUCTION

Locusts and grasshoppers (Orthoptera: Acrididae) are serious agricultural pests that cause considerable damage to food crops and pasture grasses in Africa and Western Asia (Showler, 1993), particularly during outbreaks.

At present, the main prevailing method for controlling locust and grasshopper outbreaks involves use of synthetic chemical insecticides. Due to the environmental and pest-resistance problems associated with chemical pesticides, there is an increasing interest for the exploitation of biological control agents, available as commercial products or those still under development.

Consequently, the environmental pollution by chemical pesticides such as; toxicity to non-target organisms (Tingle, 1996) and humans (Pretty, 1996) has led to new strategies and development of environmental friendly alternatives to control locusts and grasshoppers based on microbial control agents (Johnson and Goettel, 1993; Lomer *et al.*, 1997 and Lange, 2005).

Uses of bio-control agents are considered suitable and promising alternatives to chemical pesticides for controlling Acrididae pests (Van Huis, 1992). Recent advances in biological control researches, coupled with improved surveillance and intelligence, could make big differences when the next round in the battle is fought. Such bio-products could make it possible to sharply reduce the amount of chemical pesticides used (FAO, 2007 and Van der Valk, 2007).

The entomopathogenic fungi are considered promising, because some of them could be manipulated as biological pesticides. This allows the possibility of using conventional application technology by aerial spraying, which is already highly developed for locust swarms control. Microbial control agents can be effective for controlling locusts and grasshoppers for many reasons such as; effects on their activity, reproduction, food consumption, development and behavior (Woldewahid *et al.*, 2007).

M. anisopliae var. *acridum* has been registered for use in many parts of Africa (Green Muscle®), and in Australia (Green Guard®) and it is under evaluation in a number of other locust affected countries around the world (Thomas, 2000). The process of mycopathogenesis begins with attachment of the conidia with the cuticle of insect, followed by germination and penetration of the cuticle by the germ tube. Consequently, the insect death results from toxemia or nutrient depletion (Charnley, 1984).

Several authors obtained almost the same results and they reported that *M. anisopliae* var. *acridum* was effective against locusts and grasshoppers in the field, *i.e.* against desert locust, *Schistocerca gregaria* in Mauritania (Langewald *et al.*,1997), against migratory locust, *Locusta migratoria migratorioides* in an aerial treatment in Australia (Hunter *et al.*,1999), against Australian plague